PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appl. No.	: 10/649,450	Confirmation No.: 5775
Applicant	: Michael Doogue, et al.	
Filed	: August 26, 2003	
T.C./A.U.	: 2831	
Examiner	: Hung V. Ngo	
Docket No.	: ALLEG-039PUS	
Customer No.	: 022494	

RESPONSE TO NOTIFICATION OF NON-COMPLIANT APPEAL BRIEF

MS Appeal Brief - Patents
Commissioner for Patents
P. O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

In response to a Notification of Non-Compliant Appeal Brief dated April 3, 2009, please see remarks set forth below and attachments hereto.

REMARKS

Please find attached hereto, a replacement page 21 of 21 to replace page 21 of 21 of the Appeal Brief filed December 8, 2008. The replacement page indicates evidence relied upon in the Appeal Brief and indicates attachment of the evidence. Accordingly the evidence is attached hereto as listed below.

The Commissioner is hereby authorized to charge payment of any additional fees associated with this communication or credit any overpayment to Deposit Account No. 500845.

Respectfully submitted,

Dated: April 27, 2009

DALY, CROWLEY, MOFFORD & DURKEE, LLP

By: _____

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Attachments:

1) Replacement page 21 of 21 to Appeal Brief filed December 8, 2008.
2) In re Ratti, 270 F.2d 810, 123 USPQ 349 (C.C.P.A. 1959).
3) Federal Register, Volume 72, No. 195, dated October 10, 2007, page 57528, Part III of the section entitled "Examination Guidelines for Determining Obviousness under 35 U.S.C. 103 in View of the Supreme Court Decision in *KSR International Co. v. Teleflex Inc.*"
4) Wikipedia, "Semiconductor device fabrication," http://en.wikipedia.org/wiki/Semiconductor_fabrication , formerly at http://en.wikipedia.org/wiki/Fabrication_(semiconductor) .

(ix) Evidence (attached)

Relied Upon Herein:

1) In re Ratti, 270 F.2d 810, 123 USPQ 349 (C.C.P.A. 1959)

2) Federal Register, Volume 72, No. 195, dated October 10, 2007, page 57528, Part III of the section entitled "Examination Guidelines for Determining Obviousness under 35 U.S.C. 103 in View of the Supreme Court Decision in *KSR International Co. v. Teleflex Inc.*"

3) Wikipedia, "Semiconductor device fabrication,"
http://en.wikipedia.org/wiki/Semiconductor_fabrication ,
formerly at http://en.wikipedia.org/wiki/Fabrication_(semiconductor) .

(x) Related Proceedings

None

LEXSEE 270 F.2D 810

IN RE FERDINAND J. RATTI

No. 6452

United States Court of Customs and Patent Appeals

46 C.C.P.A. 976; 270 F.2d 810; 1959 CCPA LEXIS 162; 123 U.S.P.Q. (BNA) 349

Oral argument May 8, 1959

September 30, 1959

PRIOR HISTORY: [***1]

APPEAL from Patent Office, Serial No. 359,325

DISPOSITION:

REVERSED.

CASE SUMMARY:

PROCEDURAL POSTURE: Appellant applicant sought review of an order from the United States Patent Office Board of Appeals rejecting appellant's claims for a patent.

OVERVIEW: Appellant applicant sought review of an order from the board rejecting appellant's claims for a patent. The district court reversed the board's decision. The district court held that an applicant was entitled to a patent, under the statutes, unless one of the prohibitory provisions of the statutes applied. According to the court, the statutory requirements for patentability, broadly stated, were novelty, usefulness and unobviousness, as provided in 35 U.S.C.S. § § 101, 102, and 103. The district court then held that the board committed error when it considered matters outside of § § 101, 102 and 103. The district court held that the intent of Congress was that patentability was to be determined solely by the provisions of § § 101, 102, and 103.

OUTCOME: The district court reversed the board's decision holding that an applicant was entitled to a patent, under the statutes, unless one of the prohibitory provisions of the statutes applied.

LexisNexis(R) Headnotes

Patent Law > Jurisdiction & Review > Subject Matter Jurisdiction > Appeals
Patent Law > Anticipation & Novelty > General Overview
[HN1] Novelty alone is no proper basis for the allowance of a claim.

Patent Law > Jurisdiction & Review > Subject Matter Jurisdiction > Appeals
Patent Law > Anticipation & Novelty > General Overview
Patent Law > Statutory Bars > General Overview
[HN2] An applicant is entitled to a patent, under the statutes, unless one of the prohibitory provisions of the statutes applies.

Patent Law > Jurisdiction & Review > Subject Matter Jurisdiction > Appeals
Patent Law > Anticipation & Novelty > General Overview
Patent Law > Nonobviousness > General Overview
[HN3] The statutory requirements for patentability, broadly stated, are novelty, usefulness and

unobviousness, as provided in 35 U.S.C.S. § § 101, 102, and 103.

Patent Law > Jurisdiction & Review > Subject Matter Jurisdiction > Appeals
Patent Law > Infringement Actions > Infringing Acts > General Overview
[HN4] While it is true that proof that an invention is better or does possess advantages may be persuasive of the existence of any one or all of the foregoing three requirements, and hence be indicative of patentability, Congress has not seen fit to make such proof a prerequisite to patentability.

Patent Law > Jurisdiction & Review > Subject Matter Jurisdiction > Appeals
Patent Law > Anticipation & Novelty > General Overview
Patent Law > Nonobviousness > General Overview
[HN5] The intent of Congress is that patentability be determined solely by the provisions of 35 U.S.C.S. § § 101, 102, 103.

COUNSEL:

Cromwell, Greist & Warden (Raymond L. Greist of counsel) for appellant.

Clarence W. Moore (S. Wm. Cochran of counsel) for the Commissioner of Patents.

OPINIONBY:

SMITH

OPINION: [**810]

[*977] Before WORLEY, Chief Judge, and RICH, MARTIN and SMITH, Associate Judges, and Judge WILLIAM H. KIRKPATRICK n1

n1 United States Senior District Judge for the Eastern District of Pennsylvania, designated to participate in place of Judge O'Connell, pursuant to the provisions of Title 28, United States Code, Section 294(d).

SMITH, Judge, delivered the opinion of the court:

This is an appeal from the decision of the Board of Appeals of the United States Patent Office affirming the rejection by the Primary Examiner of claims 1, 4, 7, and 10 of appellant's application serial No. 359,325, filed June 3, 1953, for a patent on an "Oil Seal" for sealing the space between a bore in a housing and a relatively movable shaft centrally located in the bore.

Claim 1 is representative of claims 4 and 7 and reads:

1. A seal for insertion in a cylindrical bore in a housing about a relatively movable centrally located [***2] shaft, comprising an annular bore-engaging mounting portion of resiliently deformable material for endwise insertion in and statically sealed engagement with the bore in the housing, an annular shaft-engaging portion connected with said bore-engaging portion for running engagement with the shaft, and a metal ring located adjacent one end of said bore-engaging portion, said ring being provided with a plurality of axially extending outwardly biased spring fingers in outwardly clamped engagement with said bore-engaging portion inwardly of the outer periphery of the latter, and said ring being also provided outwardly of said bore-engaging portion with means for detachably connecting the ring to the housing outwardly of the bore in the latter. [Emphasis ours.]

[*978] Claim 10 differs from the other claims on appeal and reads:

10. A seal for insertion in a cylindrical bore in a housing about a relatively movable centrally located shaft, comprising a sealing ring having an outer bore-engaging portion of resiliently deformable material, which portion is of somewhat larger diameter than the bore in the housing, for press-fit insertion in the bore, and a metal retaining ring associated [***3] with the sealing ring, said retaining ring being connected with [**811] the sealing ring and being provided outwardly of the latter with resiliently yieldable hook formations which are adapted to be sprung into interlocking engagement with a complementary formation associated with the housing outwardly of the bore, which engagement acts to prevent axial displacement of the sealing ring relative to the bore in the housing. [Emphasis ours.]

The references in the case are:

Roth, 1,546,942, July 21, 1925.

Norton, 1,951,034, March 1, 1934.

Jepson, 2,544,324, March 6, 1951.

Chinnery et al. (British), 578,526, July 2, 1946.

Appellant's shaft seal comprises an annular sealing member of resilient deformable material which is adapted to be inserted into a cylindrical bore surrounding a relatively movable shaft. The inner portion of the sealing member is provided with a flexible lip which is held in engagement with the shaft by a garter spring. In the outer portion of the sealing member, an annular slot is provided which is concentric with and spaced from the outer periphery of the sealing member. This slot extends

axially from the end of the member and provides a pocket [***4] in which the axially extending outwardly biased spring fingers of a metallic attaching ring are located. This construction permits the spring fingers to exert a force on the resilient material in the direction of the annular wall of the bore to provide and maintain a snug engagement between the outer surface of the resilient member and the inner surface of the bore. The metallic attaching ring is also provided with radially extending resilient hooks located outwardly of the bore engaging portion of the resilient member. The housing is provided with a complementary formation outwardly of the bore which is engaged by the resilient hooks to provide a snap-on connection between the bore and the seal.

The Roth and Norton patents were relied upon by the examiner in rejecting claim 10, and since both references were considered by the board, we have included them in our consideration of this case. Roth shows a gasket structure for steam train line hose couplings. Norton shows an adjustable repair clamp for bell and spigot joints in which there is provided a sheet metal bridge piece "preferably of spring material." The bridge piece is sprung into interlocking engagement with a structural [***5] portion of the clamp and exerts its [*979] force on a resilient packing ring which, if desired, may be cemented to it.

The Chinnery et al. patent is the reference principally relied upon by the Patent Office. It shows a housing provided with a bore surrounding a centrally located shaft. A reinforced and "stiffened" sealing member formed of a material such as rubber, is press fitted into the space between the bore and the shaft. The sealing member has an inner lip held in contact with the shaft by a garter spring. The bore engaging portion of the sealing member is "stiffened" by an axially extending cylindrical sheet metal casing which acts as a reinforcing member for a definite purpose which is described by Chinnery et al. as follows:

Owing to the limited radial space within which the oil seal is to be accommodated, the holding portion of the oil seal cannot be stiffened by being massive. Consequently the holding portion of the present oil seal is stiffened in the known manner by a reinforcement, which may either encase or line, or alternatively constitute, such holding portion and therefore makes the pressfitting contact with the machine part stationary relatively thereto, [***6] or may be an internal reinforcement in the [**812] sense that it does not make press-fitting contact with the machine part stationary relatively thereto. [Emphasis ours.]

In Fig. 8 Chinnery et al. shows a radially extending flange at the outer edge of a reinforcing member of the internal reinforcement type which flange extends beyond the sealing member "to such an extent as to serve as a means of attachment of the oil seal to the housing i, additional to the interference press fit of the holding portion a in the housing recess g." The aforesaid flange is shown attached to the housing by screws or bolts.

The Jepson patent relates to a gasket for sealing the space between the upper and lower vessels of a vacuum-type coffee maker. The gasket is an annular rubber member attached to the lower part of the upper vessel and is designed to fit into the upper part of the lower one.Located in a groove in the gasket is a sleeve member provided with axially and downwardly extending spring fingers which are so biased radially as to urge the lower peripheral portion of the gasket outwardly, thus effecting a tight engagement with the mouth of the lower vessel.

Claims 1, 4, and 7 stand [***7] rejected on Chinnery et al. in view of Jepson, on the ground that it would not require "invention" to replace the cylindrical sheet metal reinforcing member, which is secured to the Chinnery et al. sealing member, by by an annular set of outwardly biased spring fingers shown by Jepson.

The problems which were solved by appellant's invention existed in this art at the time of his invention despite the Chinnery et al. disclosures. It was appellant rather than Chinnery et al. who provided [*980] the art with a shaft seal in which the resilient element of the seal could be readily inserted into a bore in the housing so that it could be removed from the bore and replaced by a new sealing element without mutilation of the sealing surface of the bore. This is particularly important, the specification points out, where the bore is formed in light metal alloys such as are used in aircraft engines and which are relatively soft and easily damaged. In appellant's oil seal, the resilient seal is so constructed that when mounted in the bore, it will establish and maintain a fluid tight relationship between the outer peripheral surface of the resilient seal member and the inside of the [***8] bore. Where either natural or synthetic rubber is used as the resilient sealing member in such seals, the rubber in time will take a set or lose its resiliency at least to the extent that the seals soon become ineffective to prevent leakage of oil. When subjected to mechanical pressures and heat, such a rubber sealing element loses its sealing effectiveness at an accelerated rate. The problems in the oil sealing art arising from such use of resilient sealing elements appear to have persisted because of the failure of the art to recognize these characteristics of the rubber sealing element and to so design the resilient element and the mounting therefor as to assure holding the outer circumference of the resilient sealing element in static oil-sealing contact with the inner circumference of the bore in which it is inserted.

Appellant's seal differs from the art of record in at least three respects:

(1) The provision of the annular slot which extends axially inward from one end of the resilient sealing element. This feature is claimed as part of the combination set forth in claim 4.

(2) The outwardly biased resilient spring means or fingers inserted in the resilient sealing [***9] element. These means are claimed as part of the combination of claims 1, 4, and 7.

(3) The "snap-on" connector which holds the resilient sealing element and engages with a complementary formation associated with the housing outwardly of the bore. This feature is in the combination of claim 10.

The patents cited by the examiner, either alone or in combination, do not disclose a resilient shaft sealing element having these features.

[1] It is common knowledge that resilient deformable materials such as either natural or synthetic rubber are [**813] incompressible, that is, while they may be deformed, this can occur only if the design and mounting of the part permits the resilient material to change its shape in response to the applied forces.

[*981] The seal construction disclosed in Chinnery et al. is such that the "interference press fit" which that patent calls for is alone relied on to keep the seal tight. There is nothing in the Chinnery et al. patent to show how the resilient sealing element is maintained in resilient contact with the bore otherwise than by the resiliency of the rubber. If and when that resiliency is lost, the sealing effect will be impaired. [***10]

Considering the incompressible nature of the rubber in the sealing element disclosed in Chinnery et al., its stiffening and reinforcement by the cylindrical sheet metal member, and its "interference press fit" in the bore, it seems clear to us that the Chinnery et al. seal cannot function in the manner of appellant's seal. Now, as to the contention that Jepson would suggest inserting a set of spring fingers, the resilient element of Chinnery et al. is forced so tightly into the bore and is so "stiffened" that the use of the resilient spring fingers of Jepson could not possibly increase the resilient deformation of the Chinnery et al. seal in the direction of the bore or increase the sealing engagement of the seal with the bore. The teaching of the Chinnery et al. patent points away from the addition of any spring element. On the other hand, we find nothing in the disclosure of Jepson's coffee maker gasket to suggest that any part of it has applicability to shaft seals. The two arts are at least somewhat remote from each other even if they both involve sealing.

We, therefore, find that Chinnery et al. did not teach the shaft sealing art how to solve the problems which existed [***11] in that art at the time of appellant's invention. [2] We hold, further, that the combination of Jepson with Chinnery et al. is not a proper ground for rejection of the claims here on appeal. This suggested combination of references would require a substantial reconstruction and redesign of the elements shown in Chinnery et al. as well as a change in the basic principles under which the Chinnery et al. construction was designed to operate.

Once appellant had taught how this could be done, the redesign may, by hindsight, seem to be obvious to one having ordinary skills in the shaft sealing art. However, when viewed as of the time appellant's invention was made, and without the benefit of appellant's disclosure, we find nothing in the art of record which suggests appellant's novel oil seal as defined in claims 1, 4, and 7.

We shall now consider the rejection of claim 10, remarking first that it differs from claims 1, 4, and 7 in that it is directed to a combination of a housing bore, a resilient sealing ring and a metal retaining ring connected to the sealing ring, wherein the metal ring has resilient hooks which secure the seal in the bore. This claim is not limited to the [***12] outwardly biased spring fingers.

[*982] The examiner rejected claim 10 on two grounds: (1) that substitution for the screw securing means of Chinnery et al. of a series of spring hooks such as disclosed by Norton would not involve patentable invention, and (2) unpatentability over Roth.

[3] We shall first dispose of the second rejection. The board held that claim 10 is drawn to a combination of a sealing ring and a housing bore in which the sealing ring is detachably placed and that Roth discloses nothing of this nature. The board therefore reversed the rejection on Roth and consequently it is not before us.

As to the first rejection, the board recognized that it was on the ground of unpatentability "over Chinnery et al. in view of Norton" and pointed out that the examiner could see nothing patentable in substituting spring hook attaching means shown in Norton for the screws of Chinnery et al. It then said:

Appellant argues that the references fail to suggest or teach how the proposed [claimed] combination could be made and after a careful consideration of the references, we [**814] have concluded that he is correct in this respect. We therefore concede [***13] that the claim * * * defines novelty over the disclosure of Fig. 8 of Chinnery et al. [HN1] Novelty alone however, is no proper basis for the allowance of a claim. [Emphasis ours.]

Although, in reaching this conclusion, the board made no reference to Norton, the context compels the conclusion that novelty was found notwithstanding the disclosure of Norton, taken together with Chinnery et al. [4] We fully agree, of course, with the board's statement that novelty alone is not enough for patentability.

With the next statement of the board, in explanation of its affirmance of the rejection of claim 10, we do not agree. It reads:

In order to properly define invention [meaning, of course, patentable invention], a claim should clearly define a structure which possesses some definite advantage over the prior art. As far as we can determine there is no better combination of housing and seal produced by using a series of snap fastener connections to connect the seal to the housing, as in appellant's structure, over using a series of bolts, as in the structure shown by Chinnery et al. Both act to merely detachably connect one element to another element and as far as we can find are [***14] merely equivalent connecting means especially in the absence of any unexpected result or advantage being obtained, by using one means in preference to the other, on which the record before us is entirely silent. [Emphasis ours.]

If we may extract from the foregoing what we understand to be the essence of the board's position in the matter, it is that claim 10 is not patentable, though it defines a combination which is novel over the disclosures of the references, because the claimed combination has not been shown to be any better than, or to possess any advantage over, what was known to the art.

[*983] As was pointed out in In re Stempel, Jr., 44 C.C.P.A. 820, 241 F.2d 755, 113 USPQ 77, [5] [HN2] an applicant is entitled to a patent, under the statutes, unless one of the prohibitory provisions of the statutes applies. [6] [HN3] The statutory requirements for patentability, broadly stated, are novelty, usefulness and unobviousness, as provided in 35 U.S.C. sections 101, 102, and 103.While [HN4] it is true that proof that an invention is better or does possess advantages may be persuasive of the existence of any one or all of the foregoing three requirements, and hence be indicative [***15] of patentability, Congress has not seen fit to make such proof a prerequisite to patentability. n2

> n2 A critical essay on the existing law has recently appeared under the title "A Proposal for: A Standard of Patentability; Consonant Statutory Changes; A Manual on Determination of Patentability," by Malcolm F. Bailey, 41 J.P.O.S. 192-225, 231-257. It advocates, as we understand it, that the present law should be changed to set up as the test for patentability, in place of the requirement of section 103 that an invention be unobvious, a requirement that the invention involve progress, which the author finds in the constitutional provisions. Congress has not seen fit to include in the statutes, at any time during the past 169 years so far as we are aware, a requirement that each and every patentable invention shall involve "progress" in this sense, i.e., that each new invention must also be shown to possess some definite advantage over the prior art. The author relates the term "progress" to individual inventions and then gives it the connotation that each such invention should be a technical advance, improvement or betterment. The very making of the suggestion to change the law is an indication that the existing law is otherwise. [***16]

Appellant's invention, as defined in claim 10, has been held by the board to possess novelty over the disclosure of Chinnery et al. Just what the board thought about the pertinency of Norton is obscure but it seems to have regarded this reference as of little moment. Appellant in his brief here said that Norton was held by the board to have no bearing on the invention and the Patent Office brief said that the appellant was correct [**815] in so stating and that the court need not consider it. We are, therefore, virtually without any reference against claim 10 except Chinnery et al. and the rejection thereon is predicated solely on a theory of patentability we find to be outside of the patent statutes, namely, that the combination of claim 10 is, by reason of the use of spring retaining hooks instead of a series of bolts, no better than the combination of Chinnery et al. However intriguing such a ground of rejection may be, [7] it is the duty of the tribunals of the Patent Office and of this court to apply the law as Congress has written it. While the provisions of the former R.S. 4893 may be said to have given the Commissioner some discretion in refusing to grant a patent [***17] on an otherwise patentable invention unless "the same is sufficiently useful and important," when the Patent Codification Act of 1952 was enacted, Congress removed this provision from old section 36 of title 35, new section 131. We take this as a further indication that it is [HN5] the intent of Congress that patentability be determined solely [*984] by the provisions of sections 101, 102, 103. We therefore reverse the board on this ground of rejection of claim 10.

If the issue before us were whether or not the spring hooks are better than the Chinnery et al. bolts - and we consider this in the event we have misapprehended the position of the board - we would hold that they are, on the basis of what is disclosed in the application. This

retaining means seems to possess many advantages over screws. Similarly, if the board was intending to say that the hooks and the bolts are merely equivalent connecting means and that claim 10 is unpatentable because its combination differs from the prior art only in the substitution of an equivalent for one element in an old combination, then we would also have to disagree since we think it is clear that the use of the spring hooks produces a [***18] result quite different from the bolts of Chinnery et al. On the record before us no reference relied on shows any spring hooks nor does it contain any support for the contention that bolts and spring hooks are equivalents.

For the foregoing reasons we reverse the rejection of claim 10.

The rejections of claims 1, 4, 7, and 10 are reversed.

MARTIN, J., concurs in result.

DISSENTBY:

KIRKPATRICK

DISSENT:

KIRKPATRICK, J., dissenting, in which Worley, C.J., joins.

I think that the board's rejection of claims 1, 4, and 7 should be affirmed. The central idea and the most important feature of these three claims, as well as of allowed claim 5, is the exertion of outwardly directed pressure upon the bore engaging portion of the sealing member, the result accomplished being to counteract the tendency of rubber to "set" or lose its resiliency and so become ineffective to prevent leakage. Jepson comes very close to completely anticipating this feature of the patent. All that would be necessary to make the anticipation complete would be to provide the Jepson seal with a shaft engaging portion and, incidentally, claim 7 does not specify any shaft engaging portion.

Of course, it was necessary [***19] that the seal be attached to the bore in a manner to prevent its displacement. Chinnery provides a flange and screws for this purpose and none of the three claims referred to calls for anything more specific than "means." Thus it seems clear that claims 1, 4, and 7 show no patentable novelty as against the prior art of Chinnery plus Jepson.

The only question is whether Jepson is in a nonanalogous art sufficiently remote from that of the application to put it beyond the probability that it would be considered by persons skilled in the art [*985] endeavoring to solve the problem to the solution of which the application is directed. I do not think that it is. Jepson was trying to meet exactly the same problem as the application under consideration, namely, to provide a compressible [**816] seal which could be readily detached or inserted in a cylindrical bore which would maintain a firm and leakproof seat on the bore when in place. I agree with the Solicitor's argument that one seeking to improve a machinery seal would reasonably be expected to investigate not only machinery seals but seals in other arts where similar problems would be encountered. See In re O'Connor, [***20] 34 C.C.P.A. 1005, 161 F.2d 221, 73 USPQ 433.

Claim 10 stands on a somewhat different basis. This claim entirely omits what I think, and have stated above, to be the heart of the application. In substance, claim 10 really amounts to no more than a claim for a hook formation to interlock with the housing of a bore in order to hold a press fit seal in place. n3 Chinnery discloses means to serve the same purpose consisting of screws.

n3 Chinnery discloses a press fit seal, but no one has suggested that there is anything new about such a device and the specification of the application before us concedes that it is old in the art.

The board conceded that the combination disclosed in claim 10, consisting of spring hooks to fasten a press fit seal to the bore, disclosed novelty over Chinnery but not patentable novelty.

I do not read the opinion of the board as predicating its conclusion of want of invention on the theory that in order to be patentable a combination must have some distinct advantage over the prior art. The board stated that there was nothing in the record to show that the substitution of hooks for screws produced any unexpected result or advantage and, therefore, [***21] concluded that the introduction of hooks did not create patentable novelty, but was a mere substitution of equivalents. The statement that the spring hooks of Ratti were no better than the screws of Chinnery was directed toward this point and seemingly was added to fortify the board's finding of equivalency rather than to propound a theory of patentability. I agree with the board that this claim, though it may show novelty over Chinnery, does not show patentable novelty, and I would affirm its rejection.

Special Accommodations

This meeting is physically accessible to people with disabilities. Requests for sign language interpretation or other auxiliary aids should be directed to Paul J. Howard (see **ADDRESSES**) at least 5 days prior to the meeting date.

Dated: October 3, 2007.

Tracey L. Thompson,

Acting Director, Office of Sustainable Fisheries, National Marine Fisheries Service.

[FR Doc. E7–19823 Filed 10–9–07; 8:45 am]

BILLING CODE 3510–22–S

DEPARTMENT OF COMMERCE

Patent and Trademark Office

[Docket No.: PTO–P–2007–0031]

Examination Guidelines for Determining Obviousness Under 35 U.S.C. 103 in View of the Supreme Court Decision in *KSR International Co.* v. *Teleflex Inc.*

AGENCY: United States Patent and Trademark Office, Commerce.

ACTION: Notice.

SUMMARY: The United States Patent and Trademark Office (USPTO) is publishing examination guidelines for determining obviousness under 35 U.S.C. 103 in view of the Supreme Court decision in *KSR International Co.* v. *Teleflex Inc.* These guidelines will assist USPTO personnel to make a proper determination of obviousness under 35 U.S.C. 103 and to provide an appropriate supporting rationale.

DATES: These guidelines are effective October 10, 2007.

FOR FURTHER INFORMATION CONTACT: Contact either Kathleen Kahler Fonda, Legal Advisor (telephone (571) 272–7754; e-mail *kathleen.fonda@uspto.gov*) or Pinchus M. Laufer, Patent Examination Policy Analyst (telephone (571) 272–7726; e-mail *pinchus.laufer@uspto.gov*), of the Office of the Deputy Commissioner for Patent Examination Policy. Alternatively, mail may be addressed to Ms. Fonda or Mr. Laufer at Commissioner for Patents, attn: KSR, P.O. Box 1450, Alexandria, VA 22313–1450.

SUPPLEMENTARY INFORMATION: These guidelines are intended to assist Office personnel to make a proper determination of obviousness under 35 U.S.C. 103, and to provide an appropriate supporting rationale in view of the recent decision by the Supreme Court in *KSR International Co.* v. *Teleflex Inc.* (KSR).[1] The guidelines are based on the Office's current understanding of the law, and are believed to be fully consistent with the binding precedent of the Supreme Court.[2]

These guidelines do not constitute substantive rule making and hence do not have the force and effect of law. They have been developed as a matter of internal Office management and are not intended to create any right or benefit, substantive or procedural, enforceable by any party against the Office. Rejections will continue to be based upon the substantive law, and it is these rejections that are appealable. Consequently, any failure by Office personnel to follow the guidelines is neither appealable nor petitionable.

To the extent that earlier guidance from the Office, including certain sections of the current Manual of Patent Examining Procedure (MPEP), is inconsistent with the guidance set forth herein, Office personnel are to follow these guidelines. The next revision of the MPEP will be updated accordingly.

I. The *KSR* Decision and Principles of the Law of Obviousness

Teleflex owned a patent claiming technology useful in the gas pedal of a car. The invention at issue in *KSR* was a pedal assembly that could be adjusted to accommodate drivers of different statures. The electronic pedal-position sensor was positioned on the support for the pedal assembly, and the pivot point of the pedal remained fixed regardless of how the pedal assembly was adjusted. This combination of the fixed pivot point for the adjustable pedal and the fixed sensor position on the support resulted in a simpler, lighter, and more compact design.

Teleflex sued KSR for infringement. The district court cited references that separately taught adjustable pedals and sensors, and found on summary judgment that Teleflex's patent was invalid for obviousness. On appeal, the Federal Circuit vacated the district court's decision, and remanded the case. The Federal Circuit stated that "the district court's analysis applied an incomplete teaching-suggestion-motivation test" in arriving at the finding of obviousness.[3]

Upon KSR's petition for review of the Federal Circuit's decision, the Supreme Court reversed, concluding that the district court had correctly determined that the patent was invalid for obviousness. The Supreme Court reaffirmed the familiar framework for determining obviousness as set forth in *Graham* v. *John Deere Co.*, but stated that the Federal Circuit had erred by applying the teaching-suggestion-motivation (TSM) test in an overly rigid and formalistic way.[4] Specifically, the Supreme Court stated that the Federal Circuit had erred in four ways: (1) "By holding that courts and patent examiners should look only to the problem the patentee was trying to solve;"[5] (2) by assuming "that a person of ordinary skill attempting to solve a problem will be led only to those elements of prior art designed to solve the same problem;"[6] (3) by concluding "that a patent claim cannot be proved obvious merely by showing that the combination of elements was 'obvious to try;'"[7] and (4) by overemphasizing "the risk of courts and patent examiners falling prey to hindsight bias" and as a result applying "[r]igid preventative rules that deny factfinders recourse to common sense."[8]

In *KSR*, the Supreme Court particularly emphasized "the need for caution in granting a patent based on the combination of elements found in the prior art,"[9] and discussed circumstances in which a patent might be determined to be obvious. Importantly, the Supreme Court reaffirmed principles based on its precedent that "[t]he combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results."[10] The Supreme Court stated that there are "[t]hree cases decided after *Graham* [that] illustrate this doctrine."[11] (1) "In *United States* v. *Adams*, * * * [t]he Court recognized that when a patent claims a structure already known in the prior art that is altered by the mere substitution of one element for another known in the field, the combination must do more than yield a predictable result."[12] (2) "In *Anderson's-Black Rock, Inc.* v. *Pavement Salvage Co.*, * * * [t]he two [pre-existing elements] in combination did no more than they would in separate, sequential operation."[13] (3) "[I]n *Sakraida* v. *AG Pro, Inc.*, the Court derived * * * the conclusion that when

[1] 550 U.S. _, 82 USPQ2d 1385 (2007).

[2] Further developments in the law of obviousness are to be expected in view of *KSR*. Thus, it is not clear which Federal Circuit decisions will retain their viability.

[3] *Teleflex Inc.* v. *KSR Int'l Co.*, 119 Fed. Appx. 282, 288 (Fed. Cir. 2005).

[4] *KSR*, 550 U.S. at __, 82 USPQ2d at 1391.

[5] *Id.* at __, 82 USPQ2d at 1397.

[6] *Id.*

[7] *Id.*

[8] *Id.*

[9] *Id.* at __, 82 USPQ2d at 1395.

[10] *Id.*

[11] *Id.*

[12] *Id.*

[13] *Id.*

a patent simply arranges old elements with each performing the same function it had been known to perform and yields no more than one would expect from such an arrangement, the combination is obvious." [14] (Internal quotations omitted.) The principles underlying these cases are instructive when the question is whether a patent application claiming the combination of elements of prior art would have been obvious. The Supreme Court further stated that:

When a work is available in one field of endeavor, design incentives and other market forces can prompt variations of it, either in the same field or a different one. If a person of ordinary skill can implement a predictable variation, 35 U.S.C. 103 bars its patentability. For the same reason, if a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skill.[15]

When considering obviousness of a combination of known elements, the operative question is thus "whether the improvement is more than the predictable use of prior art elements according to their established functions." [16]

II. The Basic Factual Inquiries of *Graham* v. *John Deere Co*

An invention that would have been obvious to a person of ordinary skill at the time of the invention is not patentable.[17] As reiterated by the Supreme Court in *KSR*, the framework for the objective analysis for determining obviousness under 35 U.S.C. 103 is stated in *Graham* v. *John Deere Co.*[18] Obviousness is a question of law based on underlying factual inquiries. The factual inquiries enunciated by the Court are as follows:

(1) Determining the scope and content of the prior art;

(2) Ascertaining the differences between the claimed invention and the prior art; and

(3) Resolving the level of ordinary skill in the pertinent art.

Objective evidence relevant to the issue of obviousness must be evaluated by Office personnel.[19] Such evidence, sometimes referred to as "secondary considerations," may include evidence of commercial success, long-felt but unsolved needs, failure of others, and unexpected results. The evidence may be included in the specification as filed, accompany the application on filing, or be provided in a timely manner at some other point during the prosecution. The weight to be given any objective evidence is decided on a case-by-case basis. The mere fact that an applicant has presented evidence does not mean that the evidence is dispositive of the issue of obviousness.

The question of obviousness must be resolved on the basis of these factual determinations. While each case is different and must be decided on its own facts, the *Graham* factors, including secondary considerations when present, are the controlling inquiries in any obviousness analysis.[20] As stated by the Supreme Court in *KSR*, "While the sequence of these questions might be reordered in any particular case, the [*Graham*] factors continue to define the inquiry that controls." [21]

Office Personnel as Factfinders

Office personnel fulfill the critical role of factfinder when resolving the *Graham* inquiries. It must be remembered that while the ultimate determination of obviousness is a legal conclusion, the underlying *Graham* inquiries are factual. When making an obviousness rejection, Office personnel must therefore ensure that the written record includes findings of fact concerning the state of the art and the teachings of the references applied. In certain circumstances, it may also be important to include explicit findings as to how a person of ordinary skill would have understood prior art teachings, or what a person of ordinary skill would have known or could have done. Factual findings made by Office personnel are the necessary underpinnings to establish obviousness.

Once the findings of fact are articulated, Office personnel must provide an explanation to support an obviousness rejection under 35 U.S.C. 103. 35 U.S.C. 132 requires that the applicant be notified of the reasons for the rejection of the claim so that he or she can decide how best to proceed. Clearly setting forth findings of fact and the rationale(s) to support a rejection in an Office action leads to the prompt resolution of issues pertinent to patentability.[22]

In short, the focus when making a determination of obviousness should be on what a person of ordinary skill in the pertinent art would have known at the time of the invention, and on what such a person would have reasonably expected to have been able to do in view of that knowledge. This is so regardless of whether the source of that knowledge and ability was documentary prior art, general knowledge in the art, or common sense. What follows is a discussion of the *Graham* factual inquiries.

A. Determining the Scope and Content of the Prior Art

In determining the scope and content of the prior art, Office personnel must first obtain a thorough understanding of the invention disclosed and claimed in the application under examination by reading the specification, including the claims, to understand what the applicant has invented.[23] The scope of the claimed invention must be clearly determined by giving the claims the "broadest reasonable interpretation consistent with the specification." [24] Once the scope of the claimed invention is determined, Office personnel must then determine what to search for and where to search.

1. *What to search for:* The search should cover the claimed subject matter and should also cover the disclosed features which might reasonably be expected to be claimed.[25] Although a rejection need not be based on a teaching or suggestion to combine, a preferred search will be directed to finding references that provide such a teaching or suggestion if they exist.

2. *Where to search:* Office personnel should continue to follow the general search guidelines set forth in MPEP § 904 to § 904.03 regarding search of the prior art. Office personnel are reminded that, for purposes of 35 U.S.C. 103, prior art can be either in the field of applicant's endeavor or be reasonably pertinent to the particular problem with which the applicant was concerned. Furthermore, prior art that is in a field of endeavor other than that of the applicant,[26] or solves a problem which

[14] *Id.* at , 82 USPQ2d at 1395–96.

[15] *Id.* at __, 82 USPQ2d at 1396.

[16] *Id.*

[17] 35 U.S.C. 103(a).

[18] 383 U.S. 1, 148 USPQ 459 (1966).

[19] *Id.* at 17–18, 148 USPQ at 467.

[20] The *Graham* factors were reaffirmed and relied upon by the Supreme Court in its consideration and determination of obviousness in the fact situation presented in *KSR*, 550 U.S. at __, 82 USPQ2d at 1391. The Supreme Court has utilized the *Graham* factors in each of its obviousness decisions since *Graham*. *See Sakraida* v. *Ag Pro, Inc.*, 425 U.S. 273, 189 USPQ 449, reh'g denied, 426 U.S. 955 (1976); *Dann* v. *Johnston*, 425 U.S. 219, 189 USPQ 257 (1976); and *Anderson's-Black Rock, Inc.* v. *Pavement Salvage Co.*, 396 U.S. 57, 163 USPQ 673 (1969).

[21] *KSR*, 550 U.S. at __, 82 USPQ2d at 1391.

[22] These guidelines focus on the proper content of an obviousness rejection, and should not be construed as dictating any particular format.

[23] *See* MPEP § 904 (8th edition, revision 5, August 2006).

[24] *See Phillips* v. *AWH Corp.*, 415 F.3d 1303, 1316, 75 USPQ2d 1321, 1329 (Fed. Cir. 2005) and MPEP § 2111.

[25] *See* MPEP § 904.02.

[26] As noted by the Court in *KSR*, "[w]hen a work is available in one field of endeavor, design

Continued

is different from that which the applicant was trying to solve, may also be considered for the purposes of 35 U.S.C. 103.[27]

For a discussion of what constitutes prior art, see MPEP § 901 to § 901.06(d) and § 2121 to § 2129.

B. Ascertaining the Differences Between the Claimed Invention and the Prior Art

Ascertaining the differences between the claimed invention and the prior art requires interpreting the claim language,[28] and considering both the invention and the prior art as a whole.[29]

C. Resolving the Level of Ordinary Skill in the Art

Any obviousness rejection should include, either explicitly or implicitly in view of the prior art applied, an indication of the level of ordinary skill. A finding as to the level of ordinary skill may be used as a partial basis for a resolution of the issue of obviousness.

The person of ordinary skill in the art is a hypothetical person who is presumed to have known the relevant art at the time of the invention. Factors that may be considered in determining the level of ordinary skill in the art may include: (1) "Type of problems encountered in the art;" (2) "prior art solutions to those problems;" (3) "rapidity with which innovations are made;" (4) "sophistication of the technology;" and (5) "educational level of active workers in the field. In a given case, every factor may not be present, and one or more factors may predominate." [30]

"A person of ordinary skill in the art is also a person of ordinary creativity, not an automaton." [31] "[I]n many cases a person of ordinary skill will be able to fit the teachings of multiple patents together like pieces of a puzzle." [32] Office personnel may also take into account "the inferences and creative steps that a person of ordinary skill in the art would employ." [33]

In addition to the factors above, Office personnel may rely on their own technical expertise to describe the knowledge and skills of a person of ordinary skill in the art.[34]

III. Rationales To Support Rejections Under 35 U.S.C. 103

Once the *Graham* factual inquiries are resolved, Office personnel must determine whether the claimed invention would have been obvious to one of ordinary skill in the art.

The obviousness analysis cannot be confined by * * * overemphasis on the importance of published articles and the explicit content of issued patents * * *. In many fields it may be that there is little discussion of obvious techniques or combinations, and it often may be the case that market demand, rather than scientific literature, will drive design trends.[35]

Prior art is not limited just to the references being applied, but includes the understanding of one of ordinary skill in the art. The prior art reference (or references when combined) need not teach or suggest all the claim limitations; however, Office personnel must explain why the difference(s) between the prior art and the claimed invention would have been obvious to one of ordinary skill in the art. The "mere existence of differences between the prior art and an invention does not establish the invention's nonobviousness." [36] The gap between the prior art and the claimed invention may not be "so great as to render the [claim] nonobvious to one reasonably skilled in the art." [37] In determining obviousness, neither the particular motivation to make the claimed invention nor the problem the inventor is solving controls. The proper analysis is whether the claimed invention would have been obvious to one of ordinary skill in the art after consideration of all the facts.[38] Factors other than the disclosures of the cited prior art may provide a basis for concluding that it would have been obvious to one of ordinary skill in the art to bridge the gap. The rationales discussed below outline reasoning that may be applied to find obviousness in such cases.

If the search of the prior art and the resolution of the *Graham* factual inquiries reveal that an obviousness rejection may be made using the familiar teaching-suggestion-motivation (TSM) rationale, then such a rejection using the TSM rationale can still be made. Although the Supreme Court in *KSR* cautioned against an overly rigid application of TSM, it also recognized that TSM was one of a number of valid rationales that could be used to determine obviousness.[39] Office personnel should also consider whether one or more of the other rationales set forth below support a conclusion of obviousness.[40] Note that the list of rationales provided below is not intended to be an all-inclusive list. Other rationales to support a conclusion of obviousness may be relied upon by Office personnel.

The key to supporting any rejection under 35 U.S.C. 103 is the clear articulation of the reason(s) why the claimed invention would have been obvious. The Supreme Court in *KSR* noted that the analysis supporting a rejection under 35 U.S.C. 103 should be made explicit. The Court quoting *In re Kahn* [41] stated that "'[R]ejections on obviousness cannot be sustained by

incentives and other market forces can prompt variations of it, either in the same field or a *different one.*" (Emphasis added) 550 U.S. at_, 82 USPQ2d at 1396.

[27] The Court in *KSR* stated that "[t]he first error * * * in this case was * * * holding that courts and patent examiners should look only to the problem the patentee was trying to solve. The Court of Appeals failed to recognize that the problem motivating the patentee may be only one of many addressed by the patent's subject matter * * *. The second error [was] * * * that a person of ordinary skill attempting to solve a problem will be led only to those elements of prior art designed to solve the same problem." 550 U.S. at __, 82 USPQ2d at 1397. Federal Circuit case law prior to the Supreme Court's decision in *KSR* is generally in accord with these statements by the *KSR* Court. *See, e.g., In re Dillon*, 919 F.2d 688, 693, 16 USPQ2d 1897, 1901 (Fed. Cir. 1990) (en banc) ("[I]t is not necessary in order to establish a *prima facie* case of obviousness that both a structural similarity between a claimed and prior art compound (or a key component of a composition) be shown and that there be a suggestion in or expectation from the prior art that the claimed compound or composition will have the same or a similar utility as one newly discovered by applicant."); *In re Lintner*, 458 F.2d 1013, 1018, 173 USPQ 560, 562 (CCPA 1972) ("The fact that [applicant] uses sugar for a different purpose does not alter the conclusion that its use in a prior art composition would be *prima facie* obvious from the purpose disclosed in the references.").

[28] *See* MPEP § 2111.

[29] *See* MPEP § 2141.02.

[30] *In re GPAC*, 57 F.3d 1573, 1579, 35 USPQ2d 1116, 1121 (Fed. Cir. 1995); *Custom Accessories, Inc.* v. *Jeffrey-Allan Indus., Inc.*, 807 F.2d 955, 962, 1 USPQ2d 1196, 1201 (Fed. Cir. 1986); *Envtl. Designs, Ltd.* v. *Union Oil Co.*, 713 F.2d 693, 696, 218 USPQ 865, 868 (Fed. Cir. 1983).

[31] *KSR*, 550 U.S. at , 82 USPQ2d at 1397.

[32] *Id.*

[33] *Id.* at __, 82 USPQ2d at 1396.

[34] The Federal Circuit has stated that examiners and administrative patent judges on the Board are "persons of scientific competence in the fields in which they work" and that their findings are "informed by their scientific knowledge, as to the meaning of prior art references to persons of ordinary skill in the art." *In re Berg*, 320 F.3d 1310, 1315, 65 USPQ2d 2003, 2007 (Fed. Cir. 2003).

[35] *KSR*, 550 U.S. at__, 82 USPQ2d at 1396.

[36] *Dann* v. *Johnston*, 425 U.S. 219, 230, 189 USPQ 257, 261 (1976).

[37] *Id.*

[38] 35 U.S.C. 103(a).

[39] According to the Supreme Court, establishment of the TSM approach to the question of obviousness "captured a helpful insight." 550 U.S. at __, 82 USPQ2d 1385, 1396 (citing *In re Bergel*, 292 F.2d 955, 956–57, 130 USPQ 206, 207–08 (1961)). Furthermore, the Court explained that "[t]here is no necessary inconsistency between the idea underlying the TSM test and the *Graham* analysis." *KSR*, 550 U.S. at __, 82 USPQ2d at 1396. The Supreme Court also commented that the Federal Circuit "no doubt has applied the test in accord with these principles [set forth in *KSR*] in many cases." *Id.* at __, 82 USPQ2d at 1396.

[40] The Court in *KSR* identified a number of rationales to support a conclusion of obviousness which are consistent with the proper "functional approach" to the determination of obviousness as laid down in Graham. *Id.* at __, 82 USPQ2d at 1395–97.

[41] 441 F.3d 977, 988, 78 USPQ2d 1329, 1336 (Fed. Cir. 2006).

mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.'" [42]

Rationales

(A) Combining prior art elements according to known methods to yield predictable results;

(B) Simple substitution of one known element for another to obtain predictable results;

(C) Use of known technique to improve similar devices (methods, or products) in the same way;

(D) Applying a known technique to a known device (method, or product) ready for improvement to yield predictable results;

(E) "Obvious to try"—choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success;

(F) Known work in one field of endeavor may prompt variations of it for use in either the same field or a different one based on design incentives or other market forces if the variations would have been predictable to one of ordinary skill in the art;

(G) Some teaching, suggestion, or motivation in the prior art that would have led one of ordinary skill to modify the prior art reference or to combine prior art reference teachings to arrive at the claimed invention.

The subsections below include discussions of each rationale along with examples illustrating how the cited rationales may be used to support a finding of obviousness. The cases cited (from which the facts were derived) may not necessarily stand for the proposition that the particular rationale is the basis for the court's holding of obviousness. Note that, in some instances, a single case is used in different subsections to illustrate the use of more than one rationale to support a finding of obviousness. It may often be the case that, once the *Graham* inquiries have been satisfactorily resolved, a conclusion of obviousness may be supported by more than one line of reasoning.

A. Combining Prior Art Elements According to Known Methods To Yield Predictable Results

To reject a claim based on this rationale, Office personnel must resolve the *Graham* factual inquiries. Office personnel must then articulate the following:

(1) a finding that the prior art included each element claimed, although not necessarily in a single prior art reference, with the only difference between the claimed invention and the prior art being the lack of actual combination of the elements in a single prior art reference;

(2) a finding that one of ordinary skill in the art could have combined the elements as claimed by known methods, and that in combination, each element merely would have performed the same function as it did separately;

(3) a finding that one of ordinary skill in the art would have recognized that the results of the combination were predictable; and

(4) whatever additional findings based on the *Graham* factual inquiries may be necessary, in view of the facts of the case under consideration, to explain a conclusion of obviousness.

The rationale to support a conclusion that the claim would have been obvious is that all the claimed elements were known in the prior art and one skilled in the art could have combined the elements as claimed by known methods with no change in their respective functions, and the combination would have yielded nothing more than predictable results to one of ordinary skill in the art at the time of the invention.[43] "[I]t can be important to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements in the way the claimed new invention does." [44] If any of these findings cannot be made, then this rationale cannot be used to support a conclusion that the claim would have been obvious to one of ordinary skill in the art.

Example 1: The claimed invention in *Anderson's-Black Rock, Inc.* v. *Pavement Salvage Co.*[45] was a paving machine which combined several well-known elements onto a single chassis. Standard prior art paving machines typically combined equipment for spreading and shaping asphalt onto a single chassis. The patent claim included the well-known element of a radiant-heat burner attached to the side of the paver for the purpose of preventing cold joints during continuous strip paving.[46] All of the component parts were known in the prior art. The only difference was the combination of the "old elements" into a single device by mounting them on a single chassis. The Court found that the operation of the heater was in no way dependent on the operation of the other equipment, and that a separate heater could also be used in conjunction with a standard paving machine to achieve the same results. The Court concluded that "[t]he convenience of putting the burner together with the other elements in one machine, though perhaps a matter of great convenience, did not produce a 'new' or 'different function'" [47] and that to those skilled in the art the use of the old elements in combination would have been obvious.

Note that combining known prior art elements is not sufficient to render the claimed invention obvious if the results would not have been predictable to one of ordinary skill in the art.[48] "When the prior art teaches away from combining certain known elements, discovery of successful means of combining them is more likely to be nonobvious." [49]

Example 2: The claimed invention in *Ruiz* v. *AB Chance Co.*[50] was directed to a system which employs a screw anchor for underpinning existing foundations and a metal bracket to transfer the building load onto the screw anchor. The prior art (Fuller) used screw anchors for underpinning existing structural foundations. Fuller used a concrete haunch to transfer the load of the foundation to the screw anchor. The prior art (Gregory) used a push pier for underpinning existing structural foundations. Gregory taught a method of transferring load using a bracket, specifically, a metal bracket transfers the foundation load to the push pier. The pier is driven into the ground to support the load. Neither reference showed the two elements of the claimed invention—screw anchor and metal bracket—used together. The court found that "artisans knew that a foundation underpinning system requires a means of connecting the foundation to the load-bearing member." [51]

The nature of the problem to be solved—underpinning unstable foundations—as well as the need to connect the member to the foundation to accomplish this goal, would have led one of ordinary skill in the art to choose an appropriate load bearing member and a compatible attachment. Therefore, it would have been obvious to use a metal bracket (as shown in Gregory) in combination with the screw anchor (as

[42] *KSR*, 550 U.S. at __, 82 USPQ2d at 1396.

[43] *Id.* at __, 82 USPQ2d at 1395; *Sakraida* v. *AG Pro, Inc.*, 425 U.S. 273, 282, 189 USPQ 449, 453 (1976); *Anderson's-Black Rock, Inc.* v. *Pavement Salvage Co.*, 396 U.S. 57, 62–63, 163 USPQ 673, 675 (1969); *Great Atl. & Pac. Tea Co.* v. *Supermarket Equip. Corp.*, 340 U.S. 147, 152, 87 USPQ 303, 306 (1950).

[44] *KSR*, 550 U.S. at __, 82 USPQ2d at 1396.

[45] 396 U.S. 57, 163 USPQ 673 (1969).

[46] The prior art used radiant heat for softening the asphalt to make patches, but did not use radiant heat burners to achieve continuous strip paving.

[47] *Id.* at 60, 163 USPQ at 674.

[48] *United States* v. *Adams*, 383 U.S. 39, 51–52, 148 USPQ 479, 483 (1966). In *Adams*, the claimed invention was to a battery with one magnesium electrode and one cuprous chloride electrode that could be stored dry and activated by the addition of plain water or salt water. Although magnesium and cuprous chloride were individually known battery components, the Court concluded that the claimed battery was nonobvious. The Court stated that "[d]espite the fact that each of the elements of the Adams battery was well known in the prior art, to combine them as did Adams required that a person reasonably skilled in the prior art must ignore" the teaching away of the prior art that such batteries were impractical and that water-activated batteries were successful only when combined with electrolytes detrimental to the use of magnesium electrodes. *Id.* at 42–43, 50–52, 148 USPQ at 480, 483.

[49] *KSR*, 550 U.S. at , 82 USPQ2d at 1395.

[50] 357 F.3d 1270, 69 USPQ2d 1686 (Fed. Cir. 2004).

[51] *Id.* at 1276, 69 USPQ2d at 1691.

shown in Fuller) to underpin unstable foundations.

B. Simple Substitution of One Known Element for Another To Obtain Predictable Results

To reject a claim based on this rationale, Office personnel must resolve the *Graham* factual inquiries. Office personnel must then articulate the following:

(1) a finding that the prior art contained a device (method, product, etc.) which differed from the claimed device by the substitution of some components (step, element, etc.) with other components;

(2) a finding that the substituted components and their functions were known in the art;

(3) a finding that one of ordinary skill in the art could have substituted one known element for another, and the results of the substitution would have been predictable; and

(4) whatever additional findings based on the *Graham* factual inquiries may be necessary, in view of the facts of the case under consideration, to explain a conclusion of obviousness.

The rationale to support a conclusion that the claim would have been obvious is that the substitution of one known element for another would have yielded predictable results to one of ordinary skill in the art at the time of the invention. If any of these findings cannot be made, then this rationale cannot be used to support a conclusion that the claim would have been obvious to one of ordinary skill in the art.

Example 1: The claimed invention in *In re Fout*[52] was directed to a method for decaffeinating coffee or tea. The prior art (Pagliaro) method produced a decaffeinated vegetable material and trapped the caffeine in a fatty material (such as oil). The caffeine was then removed from the fatty material by an aqueous extraction process. Applicant (Fout) substituted an evaporative distillation step for the aqueous extraction step. The prior art (Waterman) suspended coffee in oil and then directly distilled the caffeine through the oil. The court found that "[b]ecause both Pagliaro and Waterman teach a method for separating caffeine from oil, it would have been *prima facie* obvious to substitute one method for the other. Express suggestion to substitute one equivalent for another need not be present to render such substitution obvious."[53]

Example 2: The invention in *In re O'Farrell*[54] was directed to a method for synthesizing a protein in a transformed bacterial host species by substituting a heterologous gene for a gene native to the host species. Generally speaking, protein synthesis *in vivo* follows the path of DNA to RNA to protein. Although the prior art Polisky article (authored by two of the three inventors of the application) had explicitly suggested employing the method described for protein synthesis, the inserted heterologous gene exemplified in the article was one that normally did not proceed all the way to the protein production step, but instead terminated with the RNA. A second reference to Bahl had described a general method of inserting chemically synthesized DNA into a plasmid. Thus, it would have been obvious to one of ordinary skill in the art to replace the prior art gene with another gene known to lead to protein production, because one of ordinary skill in the art would have been able to carry out such a substitution, and the results were reasonably predictable.

In response to applicant's argument that there had been significant unpredictability in the field of molecular biology at the time of the invention, the court stated that the level of skill was quite high and that the teachings of Polisky, even taken alone, contained detailed enabling methodology and included the suggestion that the modification would be successful for synthesis of proteins.

This is not a situation where the rejection is a statement that it would have been "obvious to try" without more. Here there was a reasonable expectation of success. "Obviousness does not require absolute predictability of success."[55]

Example 3: The fact pattern in *Ruiz* v. *AB Chance Co.*[56] is set forth above in Example 2 in subsection III.A.

The prior art showed differing load-bearing members and differing means of attaching the foundation to the member. Therefore, it would have been obvious to one of ordinary skill in the art to substitute the metal bracket taught in Gregory for Fuller's concrete haunch for the predictable result of transferring the load.

Example 4: The claimed invention in *Ex parte Smith*[57] was a pocket insert for a bound book made by gluing a base sheet and a pocket sheet of paper together to form a continuous two-ply seam defining a closed pocket. The prior art (Wyant) disclosed at least one pocket formed by folding a single sheet and securing the folder portions along the inside margins using any convenient bonding method. The prior art (Wyant) did not disclose bonding the sheets to form a continuous two-ply seam. The prior art (Dick) disclosed a pocket that is made by stitching or otherwise securing two sheets along three of its four edges to define a closed pocket with an opening along its fourth edge.

In considering the teachings of Wyant and Dick, the Board "found that (1) each of the claimed elements is found within the scope and content of the prior art; (2) one of ordinary skill in the art could have combined the elements as claimed by methods known at the time the invention was made; and (3) one of ordinary skill in the art would have recognized at the time the invention was made that the capabilities or functions of the combination were predictable." Citing *KSR*, the Board concluded that "[t]he substitution of the continuous, two-ply seam of Dick for the folded seam of Wyant thus is no more than 'the simple substitution of one known element for another or the mere application of a known technique to a piece of prior art ready for improvement.'"

C. Use of Known Technique To Improve Similar Devices (Methods, or Products) in the Same Way

To reject a claim based on this rationale, Office personnel must resolve the *Graham* factual inquiries. Office personnel must then articulate the following:

(1) a finding that the prior art contained a "base" device (method, or product) upon which the claimed invention can be seen as an "improvement;"

(2) a finding that the prior art contained a "comparable" device (method, or product that is not the same as the base device) that was improved in the same way as the claimed invention;

(3) a finding that one of ordinary skill in the art could have applied the known "improvement" technique in the same way to the "base" device (method, or product) and the results would have been predictable to one of ordinary skill in the art; and

(4) whatever additional findings based on the *Graham* factual inquiries may be necessary, in view of the facts of the case under consideration, to explain a conclusion of obviousness.

The rationale to support a conclusion that the claim would have been obvious is that a method of enhancing a particular class of devices (methods, or products) was made part of the ordinary capabilities of one skilled in the art based upon the teaching of such improvement in other situations. One of ordinary skill in the art would have been capable of applying this known method of enhancement to a "base" device (method, or product) in the prior art and the results would have been predictable to one of ordinary skill in the art. The Supreme Court in *KSR* noted that if the actual application of the technique would have been beyond the skill of one of ordinary skill in the art, then using the technique would not have been obvious.[58] If any of these findings cannot be made, then this

[52] 675 F.2d 297, 213 USPQ 532 (CCPA 1982).

[53] *Id.* at 301, 213 USPQ at 536.

[54] 853 F.2d 894, 7 USPQ2d 1673 (Fed. Cir. 1988).

[55] *Id.* at 903, 7 USPQ2d at 1681.

[56] 357 F.3d 1270, 69 USPQ2d 1686 (Fed. Cir. 2004).

[57] 83 USPQ2d 1509 (Bd. Pat. App. & Int. 2007).

[58] *KSR*, 550 U.S. at __, 82 USPQ2d at 1396.

rationale cannot be used to support a conclusion that the claim would have been obvious to one of ordinary skill in the art.

Example 1: The claimed invention in *In re Nilssen*[59] was directed to a "means by which the self-oscillating inverter in a power-line-operated inverter-type fluorescent lamp ballast is disabled in case the output current from the inverter exceeds some pre-established threshold level for more than a very brief period."[60] That is, the current output was monitored, and if the current output exceeded some threshold for a specified short time, an actuation signal was sent and the inverter was disabled to protect it from damage.

The prior art (a USSR certificate) described a device for protecting an inverter circuit in an undisclosed manner via a control means. The device indicated the high-load condition by way of the control means, but did not indicate the specific manner of overload protection. The prior art (Kammiller) disclosed disabling the inverter in the event of a high-load current condition in order to protect the inverter circuit. That is, the overload protection was achieved by disabling the inverter by means of a cutoff switch.

The court found "it would have been obvious to one of ordinary skill in the art to use the threshold signal produced in the USSR device to actuate a cutoff switch to render the inverter inoperative as taught by Kammiller."[61] That is, using the known technique of a cutoff switch for protecting a circuit to provide the protection desired in the inverter circuit of the USSR document would have been obvious to one of ordinary skill.

Example 2: The fact pattern in *Ruiz* v. *AB Chance Co.*[62] is set forth above in Example 2 in subsection III.A.

The nature of the problem to be solved may lead inventors to look at references relating to possible solutions to that problem.[63] Therefore, it would have been obvious to use a metal bracket (as shown in Gregory) with the screw anchor (as shown in Fuller) to underpin unstable foundations.

D. Applying a Known Technique to a Known Device (Method, or Product) Ready for Improvement To Yield Predictable Results

To reject a claim based on this rationale, Office personnel must resolve the *Graham* factual inquiries. Office personnel must then articulate the following:

(1) a finding that the prior art contained a "base" device (method, or product) upon which the claimed invention can be seen as an "improvement;"

(2) a finding that the prior art contained a known technique that is applicable to the base device (method, or product);

(3) a finding that one of ordinary skill in the art would have recognized that applying the known technique would have yielded predictable results and resulted in an improved system; and

(4) whatever additional findings based on the *Graham* factual inquiries may be necessary, in view of the facts of the case under consideration, to explain a conclusion of obviousness.

The rationale to support a conclusion that the claim would have been obvious is that a particular known technique was recognized as part of the ordinary capabilities of one skilled in the art. One of ordinary skill in the art would have been capable of applying this known technique to a known device (method, or product) that was ready for improvement and the results would have been predictable to one of ordinary skill in the art. If any of these findings cannot be made, then this rationale cannot be used to support a conclusion that the claim would have been obvious to one of ordinary skill in the art.

Example 1: The claimed invention in *Dann* v. *Johnston*[64] was directed towards a system (*i.e.*, computer) for automatic record keeping of bank checks and deposits. In this system, a customer would put a numerical category code on each check or deposit slip. The check processing system would record these on the check in magnetic ink, just as it did for amount and account information. With this system in place, the bank can provide statements to customers that are broken down to give subtotals for each category. The claimed system also allowed the bank to print reports according to a style requested by the customer. As characterized by the Court, "[u]nder respondent's invention, then, a general purpose computer is programmed to provide bank customers with an individualized and categorized breakdown of their transactions during the period in question."[65]

Base System—The nature of the current use of data processing equipment and computer software in the banking industry was that banks routinely did much of the record keeping automatically. In routine check processing, the system read any magnetic ink characters identifying the account and routing. The system also read the amount of the check and then printed that value in a designated area of the check. The check was then sent through a further data processing step which used the magnetic ink information to generate the appropriate records for transactions and for posting to the appropriate accounts. These systems included generating periodic statements for each account, such as the monthly statement sent to checking account customers.

Improved System—The claimed invention supplemented this system by recording a category code which can then be utilized to track expenditures by category. Again, the category code will be a number recorded on the check (or deposit slip) which will be read, converted into a magnetic ink imprint, and then processed in the data system to include the category code. This enabled reporting of data by category as opposed to only allowing reporting by account number.

Known Technique—This is an application of a technique from the prior art—the use of account numbers (generally used to track an individual's total transactions) to solve the problem of how to track categories of expenditures to more finely account for a budget. That is, account numbers (identifying data capable of processing in the automatic data processing system) were used to distinguish between different customers. Furthermore, banks have long segregated debits attributable to service charges within any given separate account and have rendered their customers subtotals for those charges. Previously, one would have needed to set up separate accounts for each category and thus receive separate reports. Supplementing the account information with additional digits (the category codes) solved the problem by effectively creating a single account that can be treated as distinct accounts for tracking and reporting services. That is, the category code merely allowed what might previously have been separate accounts to be handled as a single account, but with a number of sub-accounts indicated in the report.

The basic technique of putting indicia on data which then enabled standard sorting, searching, and reporting would have yielded no more than the predictable outcome which one of ordinary skill would have expected to achieve with this common tool of the trade and was therefore an obvious expedient. The Court held that "[t]he gap between the prior art and respondent's system is simply not so great as to render the system nonobvious to one reasonably skilled in the art."[66]

[59] 851 F.2d 1401, 7 USPQ2d 1500 (Fed. Cir. 1988).

[60] *Id.* at 1402, 7 USPQ2d at 1501.

[61] *Id.* at 1403, 7 USPQ2d at 1502.

[62] 357 F.3d 1270, 69 USPQ2d 1686 (Fed. Cir. 2004).

[63] *Id.* at 1277, 69 USPQ2d at 1691.

[64] 425 U.S. 219, 189 USPQ 257 (1976).

[65] *Id.* at 222, 189 USPQ at 259.

[66] *Id.* at 230, 189 USPQ at 261.

Example 2: The fact pattern in *In re Nilssen*[67] is set forth above in Example 1 in subsection III.C.

The court found "it would have been obvious to one of ordinary skill in the art to use the threshold signal produced in the USSR device to actuate a cutoff switch to render the inverter inoperative as taught by Kammiller."[68] The known technique of using a cutoff switch would have predictably resulted in protecting the inverter circuit. Therefore, it would have been within the skill of the ordinary artisan to use a cutoff switch in response to the actuation signal to protect the inverter.

E. "Obvious To Try"—Choosing From a Finite Number of Identified, Predictable Solutions, With a Reasonable Expectation of Success

To reject a claim based on this rationale, Office personnel must resolve the *Graham* factual inquiries. Office personnel must then articulate the following:

(1) a finding that at the time of the invention, there had been a recognized problem or need in the art, which may include a design need or market pressure to solve a problem;

(2) a finding that there had been a finite number of identified, predictable potential solutions to the recognized need or problem;

(3) a finding that one of ordinary skill in the art could have pursued the known potential solutions with a reasonable expectation of success; and

(4) whatever additional findings based on the *Graham* factual inquiries may be necessary, in view of the facts of the case under consideration, to explain a conclusion of obviousness.

The rationale to support a conclusion that the claim would have been obvious is that "a person of ordinary skill has good reason to pursue the known options within his or her technical grasp. If this leads to the anticipated success, it is likely the product not of innovation but of ordinary skill and common sense. In that instance the fact that a combination was obvious to try might show that it was obvious under § 103."[69] If any of these findings cannot be made, then this rationale cannot be used to support a conclusion that the claim would have been obvious to one of ordinary skill in the art.

Example 1: The claimed invention in *Pfizer, Inc.* v. *Apotex, Inc.*[70] was directed to the amlodipine besylate drug product, which is commercially sold in tablet form in the United States under the trademark Norvasc®. At the time of the invention, amlodipine was known as was the use of besylate anions. Amlodipine was known to have the same therapeutic properties as were being claimed for the amlodipine besylate but Pfizer discovered that the besylate form had better manufacturing properties (*e.g.*, reduced "stickiness").

Pfizer argued that the results of forming amlodipine besylate would have been unpredictable, and therefore were nonobvious. The court rejected the notion that unpredictability could be equated with nonobviousness here, because there were only a finite number (53) of pharmaceutically acceptable salts to be tested for improved properties.

The court found that one of ordinary skill in the art having problems with the machinability of amlodipine would have looked to forming a salt of the compound and would have been able to narrow the group of potential salt-formers to a group of 53 anions known to form pharmaceutically acceptable salts, which would be an acceptable number to form "a reasonable expectation of success."

Example 2: The claimed invention in *Alza Corp.* v. *Mylan Laboratories, Inc.*[71] was drawn to sustained-release formulations of the drug oxybutynin in which the drug is released at a specified rate over a 24-hour period. Oxybutynin was known to be highly water-soluble, and the specification had pointed out that development of sustained-release formulations of such drugs presented particular problems.

A prior art patent to Morella had taught sustained-release compositions of highly water-soluble drugs, as exemplified by a sustained-release formulation of morphine. Morella had also identified oxybutynin as belonging to the class of highly water-soluble drugs. The Baichwal prior art patent had taught a sustained-release formulation of oxybutynin that had a different release rate than the claimed invention. Finally, the Wong prior art patent had taught a generally applicable method for delivery of drugs over a 24-hour period. Although Wong mentioned applicability of the disclosed method to several categories of drugs to which oxybutynin belonged, Wong did not specifically mention its applicability to oxybutynin.

The court found that because the absorption properties of oxybutynin would have been reasonably predictable at the time of the invention, there would have been a reasonable expectation of successful development of a sustained-release formulation of oxybutynin as claimed. The prior art, as evidenced by the specification, had recognized the obstacles to be overcome in development of sustained-release formulations of highly water-soluble drugs, and had suggested a finite number of ways to overcome these obstacles. The claims were obvious because it would have been obvious to try the known methods for formulating sustained-release compositions, with a reasonable expectation of success. The court was not swayed by arguments of a lack of absolute predictability.

Example 3: The claimed invention in *Ex parte Kubin*[72] was an isolated nucleic acid molecule. The claim stated that the nucleic acid encoded a particular polypeptide. The encoded polypeptide was identified in the claim by its partially specified sequence, and by its ability to bind to a specified protein.

A prior art patent to Valiante taught the polypeptide encoded by the claimed nucleic acid, but did not disclose either the sequence of the polypeptide, or the claimed isolated nucleic acid molecule. However, Valiante did disclose that by employing conventional methods, such as those disclosed by a prior art laboratory manual by Sambrook, the sequence of the polypeptide could be determined, and the nucleic acid molecule could be isolated. In view of Valiante's disclosure of the polypeptide, and of routine prior art methods for sequencing the polypeptide and isolating the nucleic acid molecule, the Board found that a person of ordinary skill in the art would have had a reasonable expectation that a nucleic acid molecule within the claimed scope could have been successfully obtained.

Relying on *In re Deuel,* Appellant argued that it was improper for the Office to use the polypeptide of the Valiante patent together with the methods described in Sambrook to reject a claim drawn to a specific nucleic acid molecule without providing a reference showing or suggesting a structurally similar nucleic acid molecule. Citing *KSR,* the Board stated that "when there is motivation to solve a problem and there are a finite number of identified, predictable solutions, a person of ordinary skill has good reason to pursue the known options within his or her technical grasp. If this leads to anticipated success, it is likely the product not of innovation but of ordinary skill and common sense." The Board noted that the problem facing those in the art was to isolate a specific nucleic acid, and there were a limited number of methods available to do so. The Board concluded that the skilled artisan would have had reason to try these methods with the reasonable expectation that at least one would be successful. Thus, isolating the

[67] 851 F.2d 1401, 7 USPQ2d 1500 (Fed. Cir. 1988).

[68] *Id.* at 1403, 7 USPQ2d at 1502.

[69] *KSR,* 550 U.S. at __, 82 USPQ2d at 1397.

[70] 480 F.3d 1348, 82 USPQ2d 1321 (Fed. Cir. 2007).

[71] 464 F.3d 1286, 80 USPQ2d 1001 (Fed. Cir. 2006).

[72] 83 USPQ2d 1410 (Bd. Pat. App. & Int. 2007).

specific nucleic acid molecule claimed was "the product not of innovation but of ordinary skill and common sense."

F. Known Work in One Field of Endeavor May Prompt Variations of it for Use in Either the Same Field or a Different One Based on Design Incentives or Other Market Forces if The Variations Would Have Been Predictable to One of Ordinary Skill in the Art

To reject a claim based on this rationale, Office personnel must resolve the *Graham* factual inquiries. Office personnel must then articulate the following:

(1) a finding that the scope and content of the prior art, whether in the same field of endeavor as that of the applicant's invention or a different field of endeavor, included a similar or analogous device (method, or product);

(2) a finding that there were design incentives or market forces which would have prompted adaptation of the known device (method, or product);

(3) a finding that the differences between the claimed invention and the prior art were encompassed in known variations or in a principle known in the prior art;

(4) a finding that one of ordinary skill in the art, in view of the identified design incentives or other market forces, could have implemented the claimed variation of the prior art, and the claimed variation would have been predictable to one of ordinary skill in the art; and

(5) whatever additional findings based on the *Graham* factual inquiries may be necessary, in view of the facts of the case under consideration, to explain a conclusion of obviousness.

The rationale to support a conclusion that the claimed invention would have been obvious is that design incentives or other market forces could have prompted one of ordinary skill in the art to vary the prior art in a predictable manner to result in the claimed invention. If any of these findings cannot be made, then this rationale cannot be used to support a conclusion that the claim would have been obvious to one of ordinary skill in the art.

Example 1: The fact pattern in *Dann* v. *Johnston*[73] is set forth above in Example 1 in subsection III.D.

The court found that the problem addressed by applicant—the need to give more detailed breakdown by a category of transactions—was closely analogous to the task of keeping track of the transaction files of individual business units.[74] Thus, an artisan in the data processing area would have recognized the similar class of problem and the known solutions of the prior art and it would have been well within the ordinary skill level to implement the system in the different environment. The court held that "[t]he gap between the prior art and respondent's system is simply not so great as to render the system nonobvious to one reasonably skilled in the art."[75]

Example 2: The claimed invention in *Leapfrog Enterprises, Inc.* v. *Fisher-Price, Inc.*[76] was directed to a learning device to help young children read phonetically.

The claim read as follows:

An interactive learning device, comprising:

a housing including a plurality of switches;
a sound production device in communication with the switches and including a processor and a memory;
at least one depiction of a sequence of letters, each letter being associable with a switch; and
a reader configured to communicate the identity of the depiction to the processor,
wherein selection of a depicted letter activates an associated switch to communicate with the processor, causing the sound production device to generate a signal corresponding to a sound associated with the selected letter, the sound being determined by a position of the letter in the sequence of letter.

The court concluded that the claimed invention would have been obvious in view of the combination of two pieces of prior art, (1) Bevan (which showed an electro-mechanical toy for phonetic learning), (2) the Super Speak & Read device (SSR) (an electronic reading toy), and the knowledge of one of ordinary skill in the art.

The court made clear that there was no technological advance beyond the skill shown in the SSR device. The court stated that "one of ordinary skill in the art of children's learning toys would have found it obvious to combine the Bevan device with the SSR to update it using modern electronic components in order to gain the commonly understood benefits of such adaptation, such as decreased size, increased reliability, simplified operation, and reduced cost. While the SSR only permits generation of a sound corresponding to the first letter of a word, it does so using electronic means. The combination is thus the adaptation of an old idea or invention (Bevan) using newer technology that is commonly available and understood in the art (the SSR)."

The court found that the claimed invention was but a variation on already known children's toys. This variation presented no nonobvious advance over other toys. The court made clear that there was no technological advance beyond the skill shown in the SSR device. The court found that "[a]ccomodating a prior art mechanical device that accomplishes that goal to modern electronics would have been reasonably obvious to one of ordinary skill in designing children's learning devices. Applying modern electronics to older mechanical devices has been commonplace in recent years."

Example 3: The claimed invention in *KSR International Co.* v. *Teleflex Inc.*[77] was an adjustable pedal assembly with a fixed pivot point and an electronic pedal-position sensor attached to the assembly support. The fixed pivot point meant that the pivot was not changed as the pedal was adjusted. The placement of the sensor on the assembly support kept the sensor fixed while the pedal was adjusted.

Conventional gas pedals operated by a mechanical link which adjusted the throttle based on the travel of the pedal from a set position. The throttle controlled the combustion process and the available power generated by the engine. Newer cars used computer controlled throttles in which a sensor detected the motion of the pedal and sent signals to the engine to adjust the throttle accordingly. At the time of the invention, the marketplace provided a strong incentive to convert mechanical pedals to electronic pedals, and the prior art taught a number of methods for doing so. The prior art (Asano) taught an adjustable pedal with a fixed pivot point with mechanical throttle control. The prior art ('936 patent to Byler) taught an electronic pedal sensor which was placed on a pivot point in the pedal assembly and that it was preferable to detect the pedal's position in the pedal mechanism rather than in the engine. The prior art (Smith) taught that to prevent the wires connecting the sensor to the computer from chafing and wearing out, the sensor should be put on a fixed part of the pedal assembly rather than in or on the pedal's footpad. The prior art (Rixon) taught an adjustable pedal assembly (sensor in the footpad) with an electronic sensor for throttle control. There was no prior art electronic throttle control that was combined with a pedal assembly which kept the pivot point fixed when adjusting the pedal.

The Court stated that "[t]he proper question to have asked was whether a pedal designer of ordinary skill, facing the wide range of needs created by developments in the field of endeavor, would have seen a benefit to upgrading

[73] 425 U.S. 219, 189 USPQ 257 (1976).

[74] *Id.* at 229, 189 USPQ at 261.

[75] *Id.* at 230, 189 USPQ at 261.

[76] 485 F.3d 1157, 82 USPQ2d 1687 (Fed. Cir. 2007).

[77] 550 U.S.__, 82 USPQ2d 1385 (2007).

Asano with a sensor." [78] The Court found that technological developments in the automotive design would have prompted a designer to upgrade Asano with an electronic sensor. The next question was where to attach the sensor. Based on the prior art, a designer would have known to place the sensor on a nonmoving part of the pedal structure and the most obvious nonmoving point on the structure from which a sensor can easily detect the pedal's position was a pivot point. The Court concluded that it would have been obvious to upgrade Asano's fixed pivot point adjustable pedal by replacing the mechanical assembly for throttle control with an electronic throttle control and to mount the electronic sensor on the pedal support structure.

Example 4: The claimed invention in *Ex parte Catan* [79] was a consumer electronics device using bioauthentication to authorize sub-users of an authorized credit account to place orders over a communication network up to a pre-set maximum sub-credit limit.

The prior art (Nakano) disclosed a consumer electronics device like the claimed invention, except that security was provided by a password authentication device rather than a bioauthentication device. The prior art (Harada) disclosed that the use of a bioauthentication device (fingerprint sensor) on a consumer electronics device (remote control) to provide bioauthentication information (fingerprint) was known in the prior art at the time of the invention. The prior art (Dethloff) also disclosed that it was known in the art at the time of the invention to substitute bioauthentication for PIN authentication to enable a user to access credit via a consumer electronics device.

The Board found that the prior art "shows that one of ordinary skill in the consumer electronic device art at the time of the invention would have been familiar with using bioauthentication information interchangeably with or in lieu of PINs to authenticate users." The Board concluded that one of ordinary skill in the art of consumer electronic devices would have found it obvious to update the prior art password device with the modern bioauthentication component and thereby gain, predictably, the commonly understood benefits of such adaptation, that is, a secure and reliable authentication procedure.

G. Some Teaching, Suggestion, or Motivation in the Prior Art That Would Have Led One of Ordinary Skill To Modify the Prior Art Reference or To Combine Prior Art Reference Teachings To Arrive at the Claimed Invention

To reject a claim based on this rationale, Office personnel must resolve the *Graham* factual inquiries. Office personnel must then articulate the following:

(1) a finding that there was some teaching, suggestion, or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings;

(2) a finding that there was reasonable expectation of success; and

(3) whatever additional findings based on the *Graham* factual inquiries may be necessary, in view of the facts of the case under consideration, to explain a conclusion of obviousness.

The rationale to support a conclusion that the claim would have been obvious is that "a person of ordinary skill in the art would have been motivated to combine the prior art to achieve the claimed invention and that there would have been a reasonable expectation of success." [80] If any of these findings cannot be made, then this rationale cannot be used to support a conclusion that the claim would have been obvious to one of ordinary skill in the art.

The courts have made clear that the teaching, suggestion, or motivation test is flexible and an explicit suggestion to combine the prior art is not necessary. The motivation to combine may be implicit and may be found in the knowledge of one of ordinary skill in the art, or, in some cases, from the nature of the problem to be solved.[81] "[A]n implicit motivation to combine exists not only when a suggestion may be gleaned from the prior art as a whole, but when the 'improvement' is technology-independent and the combination of references results in a product or process that is more desirable, for example because it is stronger, cheaper, cleaner, faster, lighter, smaller, more durable, or more efficient. Because the desire to enhance commercial opportunities by improving a product or process is universal—and even common-sensical—we have held that there exists in these situations a motivation to combine prior art references even absent any hint of suggestion in the references themselves. In such situations, the proper question is whether the ordinary artisan possesses knowledge and skills rendering him capable of combining the prior art references." [82]

IV. Applicant's Reply

Once Office personnel have established the *Graham* factual findings and concluded that the claimed invention would have been obvious, the burden then shifts to the applicant to (1) show that the Office erred in these findings, or (2) provide other evidence to show that the claimed subject matter would have been nonobvious. 37 CFR 1.111(b) requires applicant to distinctly and specifically point out the supposed errors in the Office's action and reply to every ground of objection and rejection in the Office action. The reply must present arguments pointing out the specific distinction believed to render the claims patentable over any applied references.

If an applicant disagrees with any factual findings by the Office, an effective traverse of a rejection based wholly or partially on such findings must include a reasoned statement explaining why the applicant believes the Office has erred substantively as to the factual findings. A mere statement or argument that the Office has not established a *prima facie* case of obviousness or that the Office's reliance on common knowledge is unsupported by documentary evidence will not be considered substantively adequate to rebut the rejection or an effective traverse of the rejection under 37 CFR 1.111(b). Office personnel addressing this situation may repeat the rejection made in the prior Office action and make the next Office action final. *See* MPEP § 706.07(a).

V. Consideration of Applicant's Rebuttal Evidence

Office personnel should consider all rebuttal evidence that is timely presented by the applicants when reevaluating any obviousness determination. Rebuttal evidence may include evidence of "secondary considerations," such as "commercial success, long felt but unsolved needs, [and] failure of others" [83], and may also include evidence of unexpected results. As set forth in section III. above, Office personnel must articulate findings of fact that support the rationale relied upon in an obviousness rejection. As a result, applicants are likely to submit evidence to rebut the fact finding made by Office personnel. For example, in the case of a claim to a combination, applicants may submit evidence or argument to demonstrate that:

(1) one of ordinary skill in the art could not have combined the claimed elements by known methods (e.g., due to technological difficulties);

(2) the elements in combination do not merely perform the function that each element performs separately; or

(3) the results of the claimed combination were unexpected.

[78] *Id.* at__, 82 USPQ2d at 1399.

[79] 83 USPQ2d 1569)Bd. Pat. App. & Int.

[80] *DyStar Textilfarben GmbH & Co. Deutschland KG* v. *C.H. Patrick Co.*, 464 F.3d 1356, 1360, 80 USPQ2d 1641, 1645 (Fed. Cir. 2006).

[81] *Id.* at 1366, 80 USPQ2d at 1649.

[82] *Id.* at 1368, 80 USPQ2d at 1651.

[83] *Graham* v. *John Deere Co.*, 383 U.S. at 17, 148 USPQ at 467.

Once the applicant has presented rebuttal evidence, Office personnel should reconsider any initial obviousness determination in view of the entire record.[84] All the rejections of record and proposed rejections and their bases should be reviewed to confirm their continued viability. The Office action should clearly communicate the Office's findings and conclusions, articulating how the conclusions are supported by the findings. The procedures set forth in MPEP § 706.07(a) are to be followed in determining whether an action may be made final.

See MPEP § 2145 concerning consideration of applicant's rebuttal evidence. See also MPEP § 716 to § 716.10 regarding affidavits or declarations filed under 37 CFR 1.132 for purposes of traversing grounds of rejection.

[84] *See, e.g., In re Piasecki*, 745 F.2d 1468, 1472, 223 USPQ 785, 788 (Fed. Cir. 1984); *In re Eli Lilly & Co.*, 90 F.2d 943, 945, 14 USPQ2d 1741, 1743 (Fed. Cir. 1990).

Dated: October 3, 2007.

Jon W. Dudas,

Under Secretary of Commerce for Intellectual Property and Director of the United States Patent and Trademark Office.

[FR Doc. E7–19973 Filed 10–9–07; 8:45 am]

BILLING CODE 3510–16–P

DEPARTMENT OF DEFENSE

Office of the Secretary

[Transmittal Nos. 08–09]

36(b)(1) Arms Sales Notification

AGENCY: Department of Defense, Defense Security Cooperation Agency.

ACTION: Notice.

SUMMARY: The Department of Defense is publishing the unclassified text of a section 36(b)(1) arms sales notification. This is published to fulfill the requirements of section 155 of Public Law 104–164 dated 21 July 1996.

FOR FURTHER INFORMATION CONTACT: Ms. B. English, DSCA/DBO/CFM, (703) 601–3740.

The following is a copy of a letter to the Speaker of the House of Representatives, Transmittals 08–09 with attached transmittal, policy justification, and Sensitivity of Technology.

Dated: October 3, 2007.

L.M. Bynum,

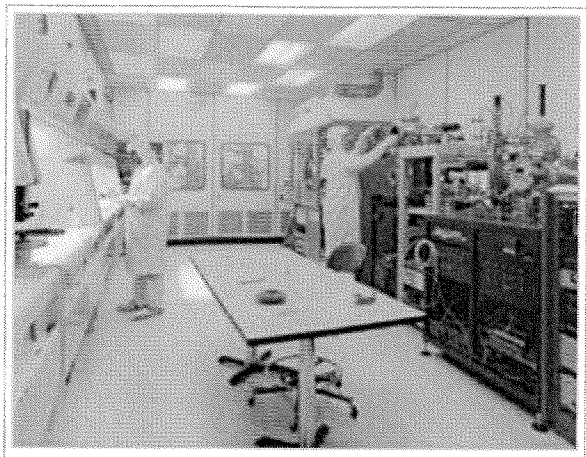
OSD Federal Register Liaison Officer, Department of Defense.

BILLING CODE 5001–06–M

Semiconductor device fabrication

From Wikipedia, the free encyclopedia

Semiconductor device fabrication is the process used to create chips, the integrated circuits that are present in everyday electrical and electronic devices. It is a multiple-step sequence of photographic and chemical processing steps during which electronic circuits are gradually created on a wafer made of pure semiconducting material. Silicon is the most commonly used semiconductor material today, along with various compound semiconductors.



NASA's Glenn Research Center cleanroom.

The entire manufacturing process from start to packaged chips ready for shipment takes six to eight weeks and is performed in highly specialized facilities referred to as fabs.

Contents

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- 2 Processing
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Wafers

A typical wafer is made out of extremely pure silicon that is grown into mono-crystalline cylindrical ingots (boules) up to 300 mm (slightly less than 12 inches) in diameter using the Czochralski process. These ingots are then sliced into wafers about 0.75 mm thick and polished to obtain a very regular and flat surface.

Once the wafers are prepared, many process steps are necessary to produce the desired semiconductor integrated circuit. In general, the steps can be grouped into two areas:[1]

- Front-end processing
- Back-end processing

Processing

In semiconductor device fabrication, the various processing steps fall into four general categories: deposition, removal, patterning, and modification of electrical properties.

- Deposition is any process that grows, coats, or otherwise transfers a material onto the wafer. Available technologies consist of physical vapor deposition (PVD), chemical vapor deposition (CVD), electrochemical deposition (ECD), molecular beam epitaxy (MBE) and more recently, atomic layer deposition (ALD) among others.
- Removal processes are any that remove material from the wafer either in bulk or selectively and consist primarily of etch processes, either wet etching or dry etching. Chemical-mechanical planarization (CMP) is also a removal process used between levels.
- Patterning covers the series of processes that shape or alter the existing shape of the deposited materials and is generally referred to as lithography. For example, in conventional lithography, the wafer is coated with a chemical called a "photoresist". The photoresist is exposed by a "stepper", a machine that focuses, aligns, and moves the mask, exposing select portions of the wafer to short wavelength light. The unexposed regions are washed away by a developer solution. After etching or other processing, the remaining photoresist is removed by plasma ashing.
- Modification of electrical properties has historically consisted of doping transistor sources and drains originally by diffusion furnaces and later by ion implantation. These doping processes are followed by furnace anneal or in advanced devices, by rapid thermal anneal (RTA) which serve to activate the implanted dopants. Modification of electrical properties now also extends to reduction of dielectric constant in low-k insulating materials via exposure to ultraviolet light in UV processing (UVP).

Many modern chips have eight or more levels produced in over 300 sequenced processing steps.

Front-end processing

"Front-end processing" refers to the formation of the transistors directly on the silicon. The raw wafer is engineered by the growth of an ultrapure, virtually defect-free silicon layer through epitaxy. In the most advanced logic devices, *prior* to the silicon epitaxy step, tricks are performed to improve the performance of the transistors to be built. One method involves introducing a "straining step" wherein a silicon variant such as "silicon-germanium" (SiGe) is deposited. Once the epitaxial silicon is deposited, the crystal lattice becomes stretched somewhat, resulting in improved electronic mobility. Another method, called "silicon on insulator" technology involves the insertion of an insulating layer between the raw silicon wafer and the thin layer of subsequent silicon epitaxy. This method results in the creation of transistors with reduced parasitic effects.

Silicon dioxide

Front-end surface engineering is followed by: growth of the gate dielectric, traditionally silicon dioxide (SiO_2), patterning of the gate, patterning of the source and drain regions, and subsequent implantation or diffusion of dopants to obtain the desired complementary electrical properties. In memory devices, storage cells, conventionally capacitors, are also fabricated at this time, either into the silicon surface or

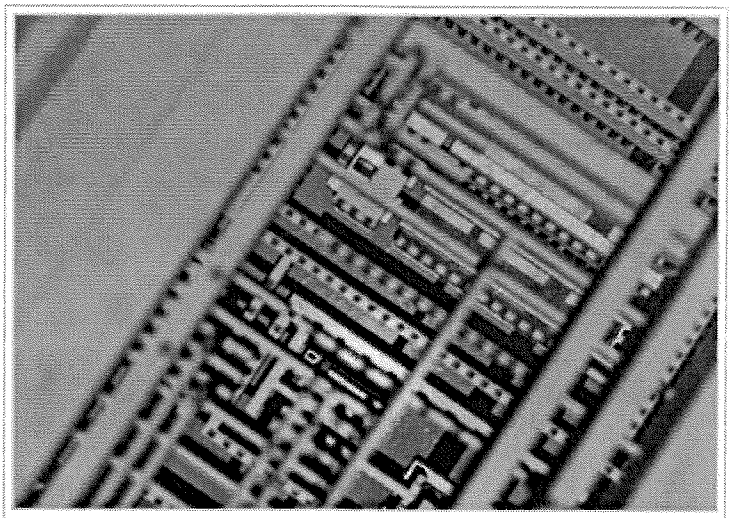
stacked above the transistor.

Metal layers

Once the various semiconductor devices have been created they must be interconnected to form the desired electrical circuits. This "back end of line" (BEOL – the latter portion of the wafer fabrication, not to be confused with "back end" of chip fabrication which refers to the package and test stages) involves creating metal interconnecting wires that are isolated by insulating dielectrics. The insulating material was traditionally a form of SiO_2 or a silicate glass, but recently new low dielectric constant materials are being used. These dielectrics presently take the form of SiOC and have dielectric constants around 2.7 (compared to 3.9 for SiO_2), although materials with constants as low as 2.2 are being offered to chipmakers.

Interconnect

Historically, the metal wires consisted of aluminum. In this approach to wiring often called "subtractive aluminum", blanket films of aluminum are deposited first, patterned, and then etched, leaving isolated wires. Dielectric material is then deposited over the exposed wires. The various metal layers are interconnected by etching holes, called "vias," in the insulating material and depositing tungsten in them with a CVD technique. This approach is still used in the fabrication of many memory chips such as dynamic random access memory (DRAM) as the number of interconnect levels is small, currently no more than four.



Synthetic detail of a standard cell through four layers of planarized copper interconnect, down to the polysilicon (pink), wells (greyish) and substrate (green).

More recently, as the number of interconnect levels for logic has substantially increased due to the large number of transistors that are now interconnected in a modern microprocessor, the timing delay in the wiring has become significant prompting a change in wiring material from aluminum to copper and from the silicon dioxides to newer low-K material. This performance enhancement also comes at a *reduced cost* via damascene processing that eliminates processing steps. In damascene processing, in contrast to subtractive aluminum technology, the dielectric material is deposited first as a blanket film, and is patterned and etched leaving holes or trenches. In "single damascene" processing, copper is then deposited in the holes or trenches surrounded by a thin barrier film resulting in filled vias or wire "lines" respectively. In "dual damascene" technology, both the trench and via are fabricated before the deposition of copper resulting in formation of both the via and line simultaneously, further reducing the number of processing steps. The thin barrier film, called copper barrier seed (CBS), is necessary to prevent copper diffusion into the dielectric. The ideal barrier film is as thin as possible. As the presence of excessive barrier film competes with the available copper wire cross section, formation of the thinnest continuous barrier represents one of the greatest ongoing challenges in copper processing today.

As the number of interconnect levels increases, planarization of the previous layers is required to ensure a flat surface prior to subsequent lithography. Without it, the levels would become increasingly crooked and extend outside the depth of focus of available lithography, interfering with the ability to pattern. CMP (chemical mechanical planarization) is the primary processing method to achieve such planarization although dry "etch back" is still sometimes employed if the number of interconnect levels is no more than three.

Wafer test

The highly serialized nature of wafer processing has increased the demand for metrology in between the various processing steps. Wafer test metrology equipment is used to verify that the wafers haven't been damaged by previous processing steps up until testing. If the number of dies—the integrated circuits that will eventually become chips— etched on a wafer exceeds a failure threshold (ie. too many failed dies on one wafer), the wafer is scrapped rather than investing in further processing.

Device test

Once the front-end process has been completed, the semiconductor devices are subjected to a variety of electrical tests to determine if they function properly. The proportion of devices on the wafer found to perform properly is referred to as the yield.

The fab tests the chips on the wafer with an electronic tester that presses tiny probes against the chip. The machine marks each bad chip with a drop of dye. The fab charges for test time; the prices are on the order of cents per second. Chips are often designed with “testability features” such as "built-in self-test" to speed testing, and reduce test costs.

Good designs try to test and statistically manage *corners*: extremes of silicon behavior caused by operating temperature combined with the extremes of fab processing steps. Most designs cope with more than 64 corners.

Packaging

Once tested, the wafer is scored and then broken into individual die. Only the good, unmarked chips go on to be packaged.

Plastic or ceramic packaging involves mounting the die, connecting the die pads to the pins on the package, and sealing the die. Tiny wires are used to connect pads to the pins. In the old days, wires were attached by hand, but now purpose-built machines perform the task. Traditionally, the wires to the chips were gold, leading to a “lead frame” (pronounced “leed frame”) of copper, that had been plated with solder, a mixture of tin and lead. Lead is poisonous, so lead-free “lead frames” are now mandated by ROHS.

Chip-scale package (CSP) is another packaging technology. Plastic packaged chips are usually considerably larger than the actual die, whereas CSP chips are nearly the size of the die. CSP can be constructed for each die *before* the wafer is diced [1].

The packaged chips are retested to ensure that they were not damaged during packaging and that the die-to-pin interconnect operation was performed correctly. A laser etches the chip's name and numbers on the package.

List of steps

This is a list of processing techniques that are employed numerous times in a modern electronic device and do not necessarily imply a specific order.

- Wafer processing
 - Wet cleans
 - Photolithography
 - Ion implantation (in which dopants are embedded in the wafer creating regions of increased (or decreased) conductivity)
 - Dry etching
 - Wet etching
 - Plasma ashing
 - Thermal treatments
 - Rapid thermal anneal
 - Furnace anneals
 - Thermal oxidation
 - Chemical vapor deposition (CVD)
 - Physical vapor deposition (PVD)
 - Molecular beam epitaxy (MBE)
 - Electrochemical Deposition (ECD). See Electroplating
 - Chemical-mechanical planarization (CMP)
 - Wafer testing (where the electrical performance is verified)
 - Wafer backgrinding (to reduce the thickness of the wafer so the resulting chip can be put into a thin device like a smartcard or PCMCIA card.)
- Die preparation
 - Wafer mounting
 - Die cutting
- IC packaging
 - Die attachment
 - IC Bonding
 - Wire bonding
 - Flip chip
 - Tab bonding
 - IC encapsulation
 - Baking
 - Plating
 - Lasermarking
 - Trim and form
- IC testing

Hazardous materials note

Many toxic materials are used in the fabrication process. These include:

- poisonous elemental dopants such as arsenic, antimony and phosphorus
- poisonous compounds like arsine, phosphine and silane
- highly reactive liquids, such as hydrogen peroxide, fuming nitric acid, sulfuric acid and hydrofluoric acid

It is vital that workers not be directly exposed to these dangerous substances. The high degree of automation common in the IC fabrication industry helps to reduce the risks of exposure of this sort. Most fabrication facillities employ exhaust management systems, such as wet scrubbers, combustors, heated absorber cartridges etc, to control the risk to workers and also the environment if these toxic materials are released into the atmosphere.

History

When feature widths were far greater than about 10 micrometres, purity was not the issue that it is today in device manufacturing. As devices became more integrated, cleanrooms became even cleaner. Today, the fabs are pressurized with filtered air to remove even the smallest particles, which could come to rest on the wafers and contribute to defects. The workers in a semiconductor fabrication facility are required to wear cleanroom suits to protect the devices from human contamination.

In an effort to increase profits, semiconductor device manufacturing has spread from Texas and California in the 1960s to the rest of the world, such as Europe, Israel, Japan, Taiwan, Korea, Singapore and China. It is a global business today.

The leading semiconductor manufacturers typically have facilities all over the world. Intel, the world's largest manufacturer, has facilities in Europe and Asia as well as the U.S. Other top manufacturers include STMicroelectronics (Europe), Analog Devices (US/Asia), Atmel (US/Europe), Freescale Semiconductor (US), Samsung (Korea), Texas Instruments (US), Advanced Micro Devices (AMD) (US/Germany) see [2], Toshiba (Japan), NEC Electronics (Japan), Infineon (Europe), Renesas (Japan), Taiwan Semiconductor Manufacturing Company (Taiwan, see TSMC web site), Sony(Japan), NXP Semiconductors (Europe), Micron Technology (US), Hynix (Korea) and SMIC (China, see SMIC web site).

See also

- Atomic layer deposition
- Cleanrooms
- Electronic design automation
- Foundry (electronics)
- GDS-II
- International Technology Roadmap for Semiconductors
- Microfabrication
- OASIS
- SEMI — The semiconductor industry trade association

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External links

- Semiconductor Manufacturing
- Intel's Animated step-by-step process
- Semiconductor Glossary
- NEC's Virtual Factory Tour
- Semiconductor materials processing
- Calculator for Silicon thermal oxidation
- BYU Cleanroom - semiconductor properties, calculators, processes, etc.
- Omron An introduction to Application Expertise - Semiconductor, Photo Voltaic & Electronics Industry

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